CLAIMS

We claim:

1. An accelerator circuit for accelerating the turn-on operation of a laser diode, the laser diode being connected to a current driver circuit providing a bias current to the laser diode, a control circuit being connected to the current driver circuit for controlling the bias current in response to a command signal indicative of the desired bias current level and the commanded power of the laser diode and a feedback signal indicative of the laser output power level, the control circuit including a compensation capacitor establishing the control loop bandwidth of the control circuit, the accelerator circuit comprising:

a timer circuit coupled to receive a first signal for turning on the laser diode, the timer providing a control signal having a first state for a preselected time duration when triggered by the first signal and having a second state at the expiration of the preselected time duration; and

a current source, responsive to the control signal, for providing a boost current to the compensation capacitor of the control circuit;

wherein the timer circuit provides the control signal having the first state for turning on the current source, and the timer circuit provides the control signal having the second state for turning off the current source.

2. The circuit of claim 1, wherein the first signal comprises a start laser signal provided by a host system instructing the laser driver circuit to turn on the laser diode.

3. The circuit of claim 1, wherein the timer circuit comprises a programmable timer providing a programmable time duration.

4. The circuit of claim 1, wherein the compensation capacitor has a first plate coupled to a Vss node and a second plate coupled to a node in the control circuit, the boost current being provided to charge the second plate of the compensation capacitor.

5. The circuit of claim 1, wherein the compensation capacitor has a first plate coupled to a Vdd node and a second plate coupled to a node in the control circuit, the boost current being provided to discharge the second plate of the compensation capacitor.

6. The circuit of claim 1, wherein the current source comprises a programmable current source providing a programmable value of boost current.

7. The circuit of claim 1, wherein the current source comprises a pulse-width-modulated current source providing a boost current having a first duty cycle.

8. The circuit of claim 7, wherein the pulse-width-modulated current source provides a boost current with a programmable duty cycle.

9. The circuit of claim 1, wherein the timer circuit provides a first output signal and the circuit further comprises:

a comparator coupled to receive the command signal and the feedback signal, the comparator providing a second output signal having a first state when the feedback signal

indicates that the laser diode has not reached the commanded power as determined by the command signal and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power; and

a first logic circuit coupled to receive the first output signal and the second output signal, the first logic circuit generating the control signal responsive to the first output signal and the second output signal;

wherein the first logic circuit provides the control signal having a first state operating to turn on the current source when the first output signal and the second output signal are in their respective first state, and the first logic circuit provides the control signal having a second state operating to turn off the current source when either the first output signal or the second output signal is in its respective second state.

10. The circuit of claim 9, wherein the first logic circuit comprises an AND logic gate.

11. The circuit of claim 9, wherein the first logic circuit comprises a one-shot logic circuit.

12. An accelerator circuit for accelerating the turn-on operation of a laser diode, the laser diode being connected to a current driver circuit providing a bias current to the laser diode, a control circuit being connected to the current driver circuit for controlling the bias current in response to a command signal indicative of the desired bias current level and the commanded power of the laser diode and a feedback signal indicative of the laser output power level, the control circuit including a compensation capacitor establishing the control loop

bandwidth of the control circuit, the accelerator circuit comprising:

a comparator coupled to receive the command signal and the feedback signal, the comparator providing a first output signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

a first logic circuit coupled to receive the first output signal and a first signal having a first state for turning on the laser diode and having a second state for turning off the laser diode, the first logic circuit generating a control signal responsive to the first output signal and the first signal; and

a current source, responsive to the control signal, for providing a boost current to the compensation capacitor of the control circuit,

wherein the first logic circuit provides the control signal having a first state operating to turn on the current source when the first output signal and the first signal are in their respective first state, and the first logic circuit provides the control signal having a second state operating to turn off the current source when either the first output signal or the first signal is in its respective second state, and wherein the control signal is asserted to the first state only once for each assertion of the first signal.

13. The circuit of claim 12, wherein the first signal comprises a start laser signal provided by a host system instructing the laser driver circuit to turn on the laser diode.

14. The circuit of claim 12, wherein the compensation capacitor has a first plate coupled to a Vss node and a second plate coupled to a node in the control circuit, the boost current being provided to charge the second plate of the compensation capacitor.

15. The circuit of claim 14, wherein the first output signal has the first state when the feedback signal has a value that is less than the command signal and the first output signal has the second state when the feedback signal has a value that is approximately equal to or greater than the command signal.

16. The circuit of claim 12, wherein the compensation capacitor has a first plate coupled to a Vdd node and a second plate coupled to a node in the control circuit, the boost current being provided to discharge the second plate of the compensation capacitor.

17. The circuit of claim 16, wherein the first output signal has the first state when the feedback signal has a value that is greater than the command signal and the first output signal has the second state when the feedback signal has a value that is approximately equal to or less than the command signal.

18. The circuit of claim 12, wherein the current source comprises a programmable current source providing a programmable value of boost current.

19. The circuit of claim 12, wherein the current source comprises a pulse-width-modulated current source providing a boost current having a first duty cycle.

20. The circuit of claim 19, wherein the pulse-width-modulated current source provides a boost current with a programmable duty cycle.

21. The circuit of claim 12, wherein the first logic circuit comprises a one-shot logic circuit.

22. The circuit of claim 21, wherein the first logic circuit comprises a reset-set flip-flop.

23. An accelerator circuit for accelerating the turn-on operation of a laser diode, the laser diode being connected to a current driver circuit providing a bias current to the laser diode, a control circuit being connected to the current driver circuit for controlling the bias current in response to a command signal indicative of the desired bias current level and the commanded power of the laser diode and a feedback signal indicative of the laser output power level, the control circuit including a compensation capacitor establishing the control loop bandwidth of the control circuit, the accelerator circuit comprising:

a comparator coupled to receive the command signal and the feedback signal, the comparator providing a first output signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

a timer circuit coupled to receive a first signal for turning on the laser diode, the timer providing a second output signal having a first state for a preselected time duration when triggered by the first signal and having a second state at the expiration of the preselected time duration;

a first logic circuit coupled to receive the first output signal and the second output signal, the first logic circuit generating a control signal responsive to the first output signal and the second output signal; and

a current source, responsive to the control signal, for providing a boost current to the compensation capacitor of the control circuit;

wherein the first logic circuit provides the control signal having a first state operating to turn on the current source when the first output signal and the second output signal are in their respective first state, and the first logic circuit provides the control signal having a second state operating to turn off the current source when either the first output signal or the second output signal is in its respective second state.

24. The circuit of claim 23, wherein the first signal comprises a start laser signal provided by a host system instructing the laser driver circuit to turn on the laser diode.

25. The circuit of claim 23, wherein the timer circuit comprises a programmable timer providing a programmable time duration.

26. The circuit of claim 23, wherein the current source comprises a programmable current source providing a programmable value of boost current.

27. The circuit of claim 23, wherein the current source comprises a pulse-width-modulated current source providing a boost current having a first duty cycle.

28. The circuit of claim 27, wherein the pulse-width-modulated current source provides a boost current with a programmable duty cycle.

29. The circuit of claim 12, wherein the first logic circuit comprises an AND logic gate.

30. The circuit of claim 12, wherein the first logic circuit comprises an one-shot logic circuit.

31. The circuit of claim 21, wherein the first logic circuit comprises a reset-set flip-flop.

32. A laser driver circuit for driving a laser diode, comprising:

a current-to-voltage converter for converting an output current of a photodiode into a feedback voltage, the photodiode monitoring the output power of the laser diode;

a differential amplifier coupled to receive the feedback voltage and a command signal indicative of a predetermined bias current level for driving the laser diode to a commanded power level, the differential amplifier providing an output signal indicative of the difference between the feedback signal and the command signal, the differential amplifier including a compensation capacitor

for determining a control loop bandwidth of the laser driver circuit;

a current driver circuit providing a bias current to the laser diode corresponding to the output signal from the differential amplifier; and

a turn-on accelerator circuit comprising:

a timer circuit coupled to receive a first signal for turning on the laser diode, the timer providing a control signal having a first state for a preselected time duration when triggered by the first signal and having a second state at the expiration of the preselected time duration; and

a current source, responsive to the control signal, for providing a boost current to the compensation capacitor of the differential amplifier;

wherein the timer circuit provides the control signal having the first state for turning on the current source, and the timer circuit provides the control signal having the second state for turning off the current source.

33. The circuit of claim 32, wherein the first signal comprises a start laser signal provided by a host system instructing the laser driver circuit to turn on the laser diode.

34. The circuit of claim 32, wherein the compensation capacitor has a first plate coupled to a Vss node and a second plate coupled to a node in the differential amplifier, the boost current being provided to charge the second plate of the compensation capacitor.

35. The circuit of claim 32, wherein the compensation capacitor has a first plate coupled to a Vdd node and a second

plate coupled to a node in the differential amplifier, the boost current being provided to discharge the second plate of the compensation capacitor.

36. The circuit of claim 32, wherein the current source comprises a pulse-width-modulated current source providing a boost current having a first duty cycle.

37. The circuit of claim 36, wherein the pulse-width-modulated current source provides a boost current with a programmable duty cycle.

38. The circuit of claim 32, wherein the timer circuit provides a first output signal and the circuit further comprises:

a comparator coupled to receive the command signal and the feedback signal, the comparator providing a second output signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power level and having a second state when the laser diode has reached or exceeded the commanded power level; and

a first logic circuit coupled to receive the first output signal and the second output signal, the first logic circuit generating the control signal responsive to the first output signal and the second output signal;

wherein the first logic circuit provides the control signal having a first state operating to turn on the current source when the first output signal and the second output signal are in their respective first state, and the first logic circuit provides the control signal having a second state operating to turn off the current source when either the first output signal or the second output signal is in its respective second state.

39. The circuit of claim 38, wherein the first logic circuit comprises an AND logic gate.

40. The circuit of claim 38, wherein the first logic circuit comprises an one-shot logic circuit.

41. A laser driver circuit for driving a laser diode, comprising:

a current-to-voltage converter for converting an output current of a photodiode into a feedback voltage, the photodiode monitoring the output power of the laser diode;

a differential amplifier coupled to receive the feedback voltage and a command signal indicative of a predetermined bias current level for driving the laser diode to a commanded power level, the differential amplifier providing an output signal indicative of the difference between the feedback signal and the command signal, the differential amplifier including a compensation capacitor for determining a control loop bandwidth of the laser driver circuit;

a current driver circuit providing a bias current to the laser diode corresponding to the output signal from the differential amplifier; and

a turn-on accelerator circuit comprising:

a comparator coupled to receive the command signal and the feedback signal, the comparator providing a first output signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

a first logic circuit coupled to receive the first output signal and a first signal having a first state for turning on the laser diode and having a second state for turning off the laser diode, the first logic circuit generating a control signal responsive to the first output signal and the first signal; and

a current source, responsive to the control signal, for providing a boost current to the compensation capacitor of the differential amplifier,

wherein the first logic circuit provides the control signal having a first state operating to turn on the current source when the first output signal and the first signal are in their respective first state, and the first logic circuit provides the control signal having a second state operating to turn off the current source when either the first output signal or the first signal is in its respective second state, and wherein the control signal is asserted to the first state only once for each assertion of the first signal.

42. The circuit of claim 41, wherein the first signal comprises a start laser signal provided by a host system instructing the laser driver circuit to turn on the laser diode.

43. The circuit of claim 41, wherein the compensation capacitor has a first plate coupled to a Vss node and a second plate coupled to a node in the differential amplifier, the boost current being provided to charge the second plate of the compensation capacitor.

44. The circuit of claim 43, wherein the first output signal has the first state when the feedback signal has a value

that is less than the command signal and the first output signal has the second state when the feedback signal has a value that is approximately equal to or greater than the command signal.

45. The circuit of claim 41, wherein the compensation capacitor has a first plate coupled to a Vdd node and a second plate coupled to a node in the differential amplifier, the boost current being provided to discharge the second plate of the compensation capacitor.

46. The circuit of claim 45, wherein the first output signal has the first state when the feedback signal has a value that is greater than the command signal and the first output signal has the second state when the feedback signal has a value that is approximately equal to or less than the command signal.

47. The circuit of claim 41, wherein the current source comprises a pulse-width-modulated current source providing a boost current having a first duty cycle.

48. The circuit of claim 47, wherein the pulse-width-modulated current source provides a boost current with a programmable duty cycle.

49. The circuit of claim 41 wherein the first logic circuit comprises a reset-set flip-flop.

50. The circuit of claim 41, wherein the differential amplifier comprises an operational amplifier.

51. A laser driver circuit for driving a laser diode, comprising:

a current-to-voltage converter for converting an output current of a photodiode into a feedback voltage, the photodiode monitoring the output power of the laser diode;

a differential amplifier coupled to receive the feedback voltage and a command signal indicative of a predetermined bias current level for driving the laser diode to a commanded power level, the differential amplifier providing an output signal indicative of the difference between the feedback signal and the command signal, the differential amplifier including a compensation capacitor for determining a control loop bandwidth of the laser driver circuit;

a current driver circuit providing a bias current to the laser diode corresponding to the output signal from the differential amplifier; and

a turn-on accelerator circuit comprising:

a comparator coupled to receive the command signal and the feedback signal, the comparator providing a first output signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

a timer circuit coupled to receive a first signal for turning on the laser diode, the timer providing a second output signal having a first state for a preselected time duration when triggered by the first signal and having a second state at the expiration of the preselected time duration;

a first logic circuit coupled to receive the first output signal and the second output signal, the first logic circuit generating a control signal responsive to the first output signal and the second output signal; and

a current source, responsive to the control signal, for providing a boost current to the compensation capacitor of the differential amplifier;

wherein the first logic circuit provides the control signal having a first state operating to turn on the current source when the first output signal and the second output signal are in their respective first state, and the first logic circuit provides the control signal having a second state operating to turn off the current source when either the first output signal or the second output signal is in its respective second state.

52. The circuit of claim 51, wherein the first signal comprises a start laser signal provided by a host system instructing the laser driver circuit to turn on the laser diode.

53. The circuit of claim 51, wherein the first logic circuit comprises an AND logic gate.

54. The circuit of claim 51, wherein the first logic circuit comprises an one-shot logic circuit.

55. The circuit of claim 54 wherein the first logic circuit comprises a reset-set flip-flop.

56. A method for turning on a laser diode, the laser diode being controlled by a control loop including a compensation

capacitor for establishing the bandwidth of the control loop, the method comprising:

receiving a first signal having a first state for turning on the laser diode;

generate a second signal having a first state for a predetermined time duration from the first signal and having a second state at the expiration of the predetermined time duration;

generating a control signal responsive to the second signal, the control signal having a first state when the second signal is in the first state, and the control signal having a second state when the second signal is in the second state;

providing a current to the compensation capacitor when the control signal is in the first state; and

terminating the current to the compensation capacitor when the control signal is in the second state.

57. The method of claim 56, wherein providing a current to the compensation capacitor comprises:

providing a current to charge the compensation capacitor when the control signal is in the first state.

58. The method of claim 56, wherein providing a current to the compensation capacitor comprises:

providing a current to discharge the compensation capacitor when the control signal is in the first state.

59. The method of claim 56, wherein providing a current to the compensation capacitor comprises:

providing a pulse-width-modulated current to the compensation capacitor when the control signal is in the first state.

60. A method for turning on a laser diode, the laser diode being controlled by a control loop including a compensation capacitor for establishing the bandwidth of the control loop, the method comprising:

receiving a first signal having a first state for turning on the laser diode and a second state for turning off the laser diode;

receiving a command signal indicative of a predetermined bias current level for driving the laser diode to a commanded power level;

receiving a feedback signal indicative of the laser output power level;

comparing the feedback signal to the command signal;

generating a second signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

providing a current to the compensation capacitor when the first signal is in the first state and the second signal is in the first state, the current being provided only once each time the first signal is in the first state;

terminating the current to the compensation capacitor when the second signal is in the second state or when the first signal is in the second state, wherein the current remains terminated until the next assertion of the first signal to the first state.

61. A method for turning on a laser diode, the laser diode being controlled by a control loop including a compensation capacitor for establishing the bandwidth of the control loop, the method comprising:

receiving a first signal having a first state for turning on the laser diode;

receiving a command signal indicative of a predetermined bias current level for driving the laser diode to a commanded power level;

receiving a feedback signal indicative of the laser output power level;

comparing the feedback signal to the command signal;

generating a second signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

generating a control signal responsive to the first signal and the second signal, the control signal having a first state when the first signal and the second signal are in their respective first state, and the control signal having a second state when either the first signal or the second signal is in its respective second state, the control signal being asserted to the first state only once for each assertion of the first signal;

providing a current to the compensation capacitor when the control signal is in the first state; and

terminating the current to the compensation capacitor when the control signal is in the second state.

62. The method of claim 61, wherein generating a control signal responsive to the first signal and the second signal comprises:

performing a logical operation on the first signal and the second signal to generate the control signal, the control signal being asserted only once for each assertion of the first signal.

63. The method of claim 61, wherein providing a current to the compensation capacitor comprises:

providing a current to charge the compensation capacitor when the control signal is in the first state.

64. The method of claim 61, wherein providing a current to the compensation capacitor comprises:

providing a current to discharge the compensation capacitor when the control signal is in the first state.

65. The method of claim 61, wherein providing a current to the compensation capacitor comprises:

providing a pulse-width-modulated current to the compensation capacitor when the control signal is in the first state.

66. A method for turning on a laser diode, the laser diode being controlled by a control loop including a compensation capacitor for establishing the bandwidth of the control loop, the method comprising:

receiving a first signal for turning on the laser diode;

generate a second signal having a first state for a predetermined time duration from the first signal and having

a second state at the expiration of the predetermined time duration;

receiving a command signal indicative of a predetermined bias current level for driving the laser diode to a commanded power level;

receiving a feedback signal indicative of the laser output power level;

comparing the feedback signal to the command signal;

generating a third signal having a first state when the feedback signal indicates that the laser diode has not reached the commanded power and having a second state when the feedback signal indicates that the laser diode has reached or exceeded the commanded power;

generating a control signal responsive to the second signal and the third signal, the control signal having a first state when the second signal and the third signal are in their respective first state, and the control signal having a second state when either the second signal or the third signal is in its respective second state;

providing a current to the compensation capacitor when the control signal is in the first state; and

terminating the current to the compensation capacitor when the control signal is in the second state.

67. The method of claim 66, wherein generating a control signal responsive to the second signal and the third signal comprises:

performing a logical "AND" operation on the second signal and the third signal to generate the control signal.